

CLAIMS

1. An apparatus for manufacturing ultra-fine particles using an electrospray device, comprising:

5 a guide duct;

one or more capillary of which tip is positioned within said guide duct, and which is connected to an injecting means for supplying solution to be sprayed, liquid droplets being sprayed from the tip of said capillary;

a carrier gas supplying means for supplying carrier gas into said guide duct to
10 carry the liquid droplets along said guide duct;

a voltage applying means connected to said capillary and said guide duct so as to generate voltage difference therebetween;

a heating means for heating outer surface of said guide duct so as to evaporate the sprayed liquid droplets and generate chemical reactions thereof; and

15 a collecting means disposed to be spaced apart from an outlet of said guide duct by a predetermined distance for collecting the ultra-fine particles formed through said chemical reactions.

2. The apparatus as claimed in claim 1, further comprising a supporting member
20 which is fitted into said guide duct, with said capillary held by the supporting member while passing through the supporting member, said supporting member being provided with a throughhole for allowing interior of said guide duct to communicate with outside of said guide duct.

25 3. The apparatus as claimed in claim 2, further comprising a cooling means connected to said collecting means for cooling said collecting means.

4. The apparatus as claimed in claim 1, wherein said guide duct is constructed with a plurality of mutually connected and electrically insulated tubes so that a different level of
30 voltage is applied to the respective tube.

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5. The apparatus as claimed in claim 1, wherein said capillary comprises a plurality of capillaries, and the plurality of capillaries are formed on a pipe so that the capillaries can extend therefrom.

5 6. The apparatus as claimed in claim 5, wherein said pipe is installed to pass through an outer wall of said guide duct, and said pipe and said guide duct are electrically insulated from each other.

7. The apparatus as claimed in claim 1, wherein said voltage applying means
10 comprises a single power supply and a plurality of variable resistors.

8. An apparatus for manufacturing ultra-fine particles using an electrospray device, comprising:

a first guide duct;

15 a second guide duct positioned at an outer side of said first guide duct and having an axis coaxial with said first guide duct;

a third guide duct positioned at an outer side of said second guide duct and having an axis coaxial with said first and second guide ducts;

one or more capillary of which tip is positioned within said first guide duct, and
20 which is connected to an injecting means for supplying solution to be sprayed, liquid droplets being sprayed from the tip of said capillary;

a carrier gas supplying means for supplying carrier gas into said first guide duct to carry the liquid droplets along said first guide duct;

a sheath gas supplying means for supplying sheath gas into said second guide duct;

25 a fuel gas supplying means for supplying fuel gas into said third guide duct;

a voltage applying means connected to said capillary and said first guide duct so as to generate a voltage difference therebetween; and

a collecting means disposed to be spaced apart from outlets of said guide ducts by a predetermined distance for collecting the ultra-fine particles formed through chemical
30 reactions.

9. The apparatus as claimed in claim 8, further comprising a supporting member which is fitted into said guide duct, with said capillary held by the supporting member while penetrating the supporting member, said supporting member being provided with first, second and third throughhole for allowing interiors of said first, second and third
5 guide ducts to communicate with outsides of said first, second and third guide ducts.

10. The apparatus as claimed in claim 9, further comprising a cooling means connected to said collecting means for cooling said collecting means.

10 11. The apparatus as claimed in claim 8, wherein said voltage applying means comprises a single power supply and a plurality of variable resistors.

12. A method for manufacturing ultra-fine particles using an electrospray device, comprising the steps of:

15 injecting solution to be sprayed into one or more capillary of which tip is positioned within a guide duct;

applying a high voltage to said capillary and applying a low voltage to said guide duct;

20 applying energy to liquid droplets sprayed from the tip of said capillary so that chemical reactions thereof can occur; and

collecting ultra-fine particles formed through said chemical reactions by using a collecting means positioned in front of said guide duct.

25 13. The method as claimed in claim 12, further comprising a step of cooling the collecting means.

14. The method as claimed in claim 12, wherein outer surface of said guide duct is heated so as to apply the energy to the sprayed liquid droplets.

30 15. The method as claimed in claim 12, wherein fuel gas is supplied into said guide

duct and is ignited so as to apply the energy to the sprayed liquid droplets, and sheath gas is supplied into said guide duct so that flames generated from the ignition of the fuel gas can be blocked and said ultra-fine particles formed through said chemical reactions are prevented from adhering to an inner wall of said guide duct.

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